IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Kiyoshi Arita, et al.
Appln. No.	:	10/561,421
Filed	:	December 19, 2005
Title	:	PLASMA PROCESSING APPARATUS
Conf. No.	:	6382
Art Unit	:	1792
Examiner	:	Jeffrie Robert Lund
Customer No.	:	00116
Docket No.	:	NGB-39102

APPEAL BRIEF

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REAL PARTY IN INTEREST

The real party in interest in the subject proceeding is Matsushita Electric Industrial Co., Ltd.

RELATED APPEALS AND INTERFERENCES

There are no known prior and pending appeals, judicial proceedings or interferences known to the appellant that may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Each of claims 1-13 in the present proceeding stand rejected and is being appealed.

STATUS OF AMENDMENTS

No amendments to the claims were made subsequent to the final rejection mailed February 8, 2008.

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1:

Independent claim 1 provides a plasma processing apparatus that performs a plasma process for the reverse face of a wafer for which an insulating sheet is adhered to the obverse face. (p. 9, ll. 24-27) The plasma process, handles at least two wafers, a large wafer and a small wafer. (p. 9, l. 27 – p. 10, l. 2) The apparatus includes an integrally formed electrode member, which is located in a process chamber that defines a closed space. (Figs. 1-3; p. 10, ll. 13-14; p. 15, l. 26 – p. 16, l. 3) The electrode has a mounting face larger than a large wafer so that a wafer can be mounted while the insulating sheet is contacting the mounting face. (Fig. 4; p. 15, ll. 12-15; p. 14, ll. 20-24) The apparatus further includes a pressure reduction unit, for discharging a gas from the closed space to reduce pressure. (p. 12, ll. 3-6) The apparatus further includes a gas supply unit, for supplying a plasma generation gas to the closed space in which the pressure has been reduced. (p. 13, ll. 15-17, ll. 20-26) The apparatus further includes an opposing electrode, positioned opposite the electrode member (Fig. 1; p. 10, l. 27 – p. 11, l. 3) The apparatus further includes a plasma generator, for applying a high frequency voltage between the electrode member and the opposing electrode to set the plasma generation gas into a plasma state. (p. 12, ll. 14-17) The apparatus further includes a DC voltage application unit, for applying a DC voltage to the electrode member to electrostatically attract the wafer positioned on the mounting face. (p. 13, ll. 8-11). The apparatus further includes a cooling unit for cooling the electrode member. (p. 17, ll. 10-11) The apparatus further includes a cover member, which has a ring shape and which is detachably covering outer portion of the mounting face, an inner diameter of the cover member being substantially equal to an outer diameter of the wafer placed on the mounting face. (p. 20, ll. 1-8) The mounting face of the electrode member is divided into

a first area, which is located in the center of the mounting face, wherein a metal, the material used for the electrode member, is exposed (p. 17, ll. 17-24), a first insulating area, the surface of which is covered with an insulating film, that encloses, like a ring, the outer edge of the first area, (p. 17, ll. 24 –27) a second area, wherein the metal is exposed, that is extended, like a ring, around the outer edge of the first insulating area (p. 18, ll. 3-7), and a second insulating area, the surface of which is covered with an insulating film, that encloses, like a ring, the outer edge of the second area. (p. 18, ll. 8-11) A boundary between the first area and the first insulating area is designated inside the outer edge of a small wafer positioned in the center of the mounting face, and a boundary between the first insulating area and the second area is designated outside the outer edge of the small wafer. (Fig. 4; p. 19, ll. 9-18) A boundary between the second area and the second insulating area is designated inside the outer edge of a large wafer positioned in the center of the mounting face, and the second insulating area extends outward from the large wafer. (Fig. 4; p. 19, ll. 20-26)

<u>Claim 9:</u>

Independent claim 9 provides a plasma processing apparatus that performs a plasma process for the reverse face of a wafer for which an insulating sheet is adhered to the obverse face. (p. 9, ll. 24-27) The plasma process, handles at least two wafers, a large wafer and a small wafer. (p. 9, l. 27 – p. 10, l. 2) The apparatus includes an integrally formed electrode member, which is located in a process chamber that defines a closed space. (Figs. 1-3; p. 10, ll. 13-14; p. 15, l. 26 – p. 16, l. 3) The electrode has a mounting face larger than a large wafer so that a wafer can be mounted while the insulating sheet is contacting the mounting face. (Fig. 4; p. 15, ll. 12-15; p. 14, ll. 20-24) The apparatus further includes a pressure reduction unit, for discharging a

gas from the closed space to reduce pressure. (p. 12, ll. 3-6) The apparatus further includes a gas supply unit, for supplying a plasma generation gas to the closed space in which the pressure has been reduced. (p. 13, ll. 15-17, ll. 20-26) The apparatus further includes an opposing electrode, positioned opposite the electrode member (Fig. 1; p. 10, l. 27 – p. 11, l. 3) The apparatus further includes a plasma generator, for applying a high frequency voltage between the electrode member and the opposing electrode to set the plasma generation gas into a plasma state. (p. 12, ll. 14-17) The apparatus further includes a DC voltage application unit, for applying a DC voltage to the electrode member to electrostatically attract the wafer positioned on the mounting face. (p. 13, ll. 8-11). The apparatus further includes a cooling unit for cooling the electrode member. (p. 17, ll. 10-11) The mounting face of the electrode member is divided into a first area, which is located in the center of the mounting face, wherein a metal, the material used for the electrode member, is exposed (p. 17, ll. 17-24), a first insulating area, the surface of which is covered with an insulating film, that encloses, like a ring, the outer edge of the first area, (p. 17, ll. 24 –27) a second area, wherein the metal is exposed, that is extended, like a ring, around the outer edge of the first insulating area (p. 18, ll. 3-7), and a second insulating area, the surface of which is covered with an insulating film, that encloses, like a ring, the outer edge of the second area. (p. 18, ll. 8-11) A boundary between the first area and the first insulating area is designated inside the outer edge of a small wafer positioned in the center of the mounting face, and a boundary between the first insulating area and the second area is designated outside the outer edge of the small wafer. (Fig. 4; p. 19, ll. 9-18) A boundary between the second area and the second insulating area is designated inside the outer edge of a large wafer positioned in the center of the mounting face, and the second insulating area extends outward from the large wafer. (Fig. 4; p. 19, ll. 20-26) A plurality of suction holes are formed in the first and second

areas. (Fig. 4; p. 20, l. 23; p. 20, l. 25) A vacuum suction unit is provided to create a vacuum and produce suction that, through the suction holes, draws the wafer to and holds the wafer on the mounting face. (p. 22, ll. 23-26) A cover member, which has a ring shape and is detachable from the mounting face, is closely adhered across the entire face of the second area to completely cover all the suction holes formed in the second area. (p. 20, ll. 1-5)

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

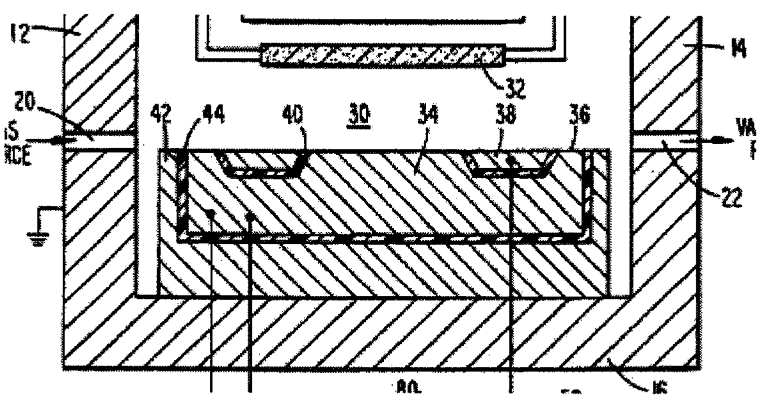
Claims 1-6 and 9-13 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,625,526 to Watanabe et al. ("Watanabe") in view of U.S. Patent No. 5,670,066 to Barnes et al. ("Barnes"), U.S. Patent No. 6,815,646 to Ito et al. ("Ito"), U.S. Patent No. 5,589,003 to Zhao et al. ("Zhao") and U.S. Patent No. 6,164,633 to Mulligan et al. ("Mulligan").

ARGUMENT

The proposed combination of Watanabe, Barnes, Ito, Zhao, and Mulligan fails to render obvious a processing apparatus in which a boundary between a first area and a first insulating area is designated inside an outer edge of a small wafer positioned in the center of a mounting face, and a boundary between the first insulating area and a second area is designated outside the outer edge of the small wafer; and wherein a boundary between the second area and a second insulating area is designated inside the outer edge of a large wafer position in the center of the mounting face, and the second insulating area extends outward from the large wafer, as required by independent claims 1 and 9.

Each of the independent claims (claims 1 and 9) of the present application includes the limitations, "wherein a boundary between the first area and the first insulating area is designated inside the outer edge of a small wafer position in the center of the mounting face, and a boundary between the first insulating area and the second area is designated outside the outer edge of the small wafer, and wherein a boundary between the second area and the second insulating area is designated inside the outer edge of a large wafer positioned in the center of the mounting face, and the second insulating area extends outward from the large wafer." In other words, the areas of the mounting face are configured such that outer edges of the small and large wafers lie within the boundaries of the corresponding insulating rings. In the Final Office action mailed February 8, 2008, the examiner conceded that Watanabe does not teach the above-cited limitations. In fact, the examiner fails to point to any reference that discloses these limitations. Barnes is relied upon by the examiner to disclose a first metal area surrounded by a first insulating ring; a second metal area surrounding the first insulating ring; and a second insulating ring surrounding the second metal area. A true and accurate portion of Figure 1 of Barnes is reproduced below for reference. The examiner relies on first electrode (34), electrical insulating coating (40), second electrode (38), and electrical insulator (44) as being equivalent to the claimed first area, first

insulating area, second area, and second insulating area, respectively. However, as clearly seen in Figure 1 below, Barnes does not disclose that the insulating rings (40, 44) are configured in an area such that an outer edge of a wafer (32) lies within the boundaries of the insulating rings (40, 44). Rather, the mounting face is configured such that the outer edge of the wafer (32) is positioned within the boundary of the second electrode (38). [Col. 4, ll. 14-18] The electrical insulating rings (40, 44) of Barnes are merely used so that the first and second electrodes (34, 38) can be at different electric potentials relative to each other and the housing (42). [Col. 3, ll. 49-61]



Further, Barnes is specifically configured in the manner shown above so that a DC voltage can be applied between the first and second electrodes (34, 38) to produce an electrostatic force, which clamps the wafer (32) in situ between the electrodes (34, 38). [Col. 3, l. 64-Col. 4, l. 1] Accordingly, there is nothing in Barnes that discloses, teaches, suggests, or otherwise renders obvious a configuration in which the outer edges of small and large wafers lies within the boundaries of corresponding insulating rings.

In the 'Response to Arguments' section of the final Office action, the examiner states, "Barnes teaches insulating objects supported by the surface of the face of the single electrode

member." However, as discussed herein and in the specification of Barnes, the insulating portions (40 and 44) of the chuck are provided so that the electrodes and the housing can be of different electrode potentials. The insulation portions are <u>*not*</u> provided for insulating objects that are *supported by* the chuck, as contended by the examiner. In this section, the examiner then relies on Zhao as motivation to modify the configuration taught by Barnes.

More specifically, the examiner states that because Zhao teaches covering the radially outward surface of the face of a single electrode member not covered by the wafer to prevent damaging the surface of the face of the single electrode member through exposure to the plasma, motivation is provided to apply the insulating coating of Barnes on outer diameter portions corresponding to the different sized wafers. Applicants strongly disagree. Zhao is directed to a shield structure (10) composed of an edge part (12) and a central part (14). A true and accurate portion of Figure 1 of Zhao is reproduced below for ease of reference.

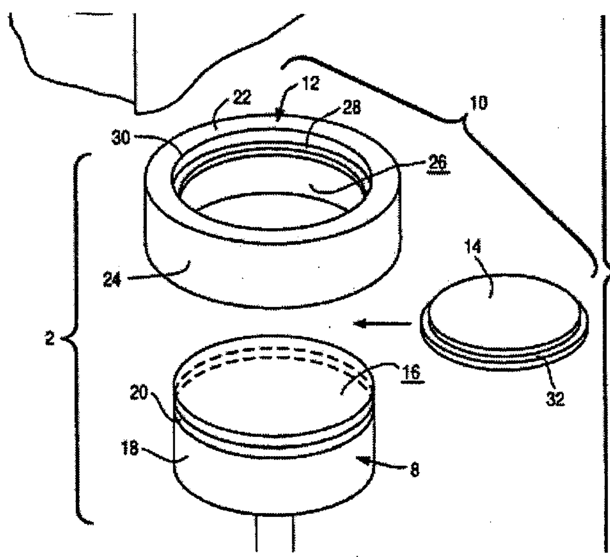


FIG. 1

The shield structure, including both the edge part (12) and the central part (14), is provided to protect the substrate support base (8) from corrosion during cleaning processes [Col. 2, ll. 58-60] and not for protecting a radially outward surface of the electrode from exposure to plasma, as contended by the examiner. In fact, Zhao discloses that the entire shield structure (12, 14) can be

used during the plasma deposition process. The central part (14) is made from a ceramic material, such as an aluminum nitride (AlN) ceramic, due to its high thermal conductivity, corrosion resistance, and tolerance to thermal shock. Because the edge part (12) does not underlie the substrate undergoing processing, it need not be made of AlN ceramic, as AlN ceramic is very expensive and not easy to fabricate a single piece that covers both the top and sides of the base. [Col. 4, ll. 8-21] There is no mention in Zhao of using the edge part (12) for protecting the surface of the electrode from exposure to plasma. If that were truly the intention, the skirt portion (24) of the shield structure would be unnecessary.

Because Zhao is concerned with protection of the entire substrate base 8 (which includes the support surface 16, sidewall 18, and annular groove 20) during a cleaning operation, one skilled in the art would not have been motivated by Zhao to reposition the insulating portions (40, 44) of Barnes such that they would border an outer edge portion of a wafer. In fact, to do so would render both of the references unsuitable for their intended purposes.

For at least the reasons above, it is requested that the examiner's rejection be reversed.

Respectfully submitted,

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Date: October 7, 2008

CLAIMS APPENDIX

1. A plasma processing apparatus, which performs a plasma process for the reverse face of a wafer for which an insulating sheet is adhered to the obverse face and which, for the plasma process, handles at least two wafers, a large wafer and a small wafer, comprising:

an integrally formed electrode member, which is located in a process chamber that defines a closed space and which has a mounting face larger than a large wafer so that a wafer can be mounted while the insulating sheet is contacting the mounting face;

a pressure reduction unit, for discharging a gas from the closed space to reduce pressure;

a gas supply unit, for supplying a plasma generation gas to the closed space in which the pressure has been reduced;

an opposing electrode, positioned opposite the electrode member;

a plasma generator, for applying a high frequency voltage between the electrode member and the opposing electrode to set the plasma generation gas into a plasma state;

a DC voltage application unit, for applying a DC voltage to the electrode member to electrostatically attract the wafer positioned on the mounting face;

a cooling unit for cooling the electrode member; and

a cover member, which has a ring shape and which is detachably covering outer portion of the mounting face, an inner diameter of the cover member being substantially equal to an outer diameter of the wafer placed on the mounting face,

wherein the mounting face of the electrode member is divided into

a first area, which is located in the center of the mounting face, wherein a metal, the material used for the electrode member, is exposed,

a first insulating area, the surface of which is covered with an insulating film, that encloses, like a ring, the outer edge of the first area,

a second area, wherein the metal is exposed, that is extended, like a ring, around the outer edge of the first insulating area, and

a second insulating area, the surface of which is covered with an insulating film, that encloses, like a ring, the outer edge of the second area,

wherein a boundary between the first area and the first insulating area is designated inside the outer edge of a small wafer positioned in the center of the mounting face, and a boundary between the first insulating area and the second area is designated outside the outer edge of the small wafer, and

wherein a boundary between the second area and the second insulating area is designated inside the outer edge of a large wafer positioned in the center of the mounting face, and the second insulating area extends outward from the large wafer.

2. A plasma processing apparatus according to claim 1, wherein said cover member completely covers the second area.

3. A plasma processing apparatus according to claim 2, wherein the cover member is attached to the mounting face when a small wafer is to be processed, or is removed from the mounting face when a large wafer is to be processed.

4. A plasma processing apparatus according to claim 2, wherein the cover member is made of ceramic.

5. A plasma processing apparatus according to claim 2, wherein the cover member is formed of a thick outer ring and a thin internal ring that engages the thick outer ring.

6. A plasma processing apparatus according to claim 1, wherein the insulating film covering the first insulating area and the insulating film covering the second insulating area are made of aluminous ceramic.

7. A plasma processing apparatus according to claim 3, further comprising:

a plurality of suction holes formed in the first area and the second area;

a vacuum suction unit for creating a vacuum and producing suction that, through the suction holes, draws the wafer to and holds the wafer on the mounting face; and

a blocking member, having a ring shape, that is attached to the second area, when the cover member is mounted on the mounting face, to block the plurality of suction holes in the second area,

wherein the cover member completely covers the blocking member.

8. A plasma processing apparatus according to claim 6, wherein the blocking member is formed by adhering, to one face of a ring-shaped plate made of the same material as the wafer, an insulating sheet made of the same material as the insulating sheet that is adhered to the wafer.

9. A plasma processing apparatus according to the present invention, which performs a plasma process for the reverse face of a wafer for which an insulating sheet is adhered to the obverse face and which, for the plasma process, can handle at least two wafers, a large wafer and a small wafer, comprising:

an integrally formed electrode member, which is located in a process chamber that defines a closed space and which has a mounting face larger than a large wafer so that a wafer can be mounted while the insulating sheet is contacting the mounting face;

a pressure reduction unit, for discharging a gas from the closed space to reduce pressure;

a gas supply unit, for supplying a plasma generation gas to the closed space in which the pressure has been reduced;

an opposing electrode, positioned opposite the electrode member;

a plasma generator, for applying a high frequency voltage between the electrode member and the opposing electrode to set the plasma generation gas into a plasma state;

a DC voltage application unit, for applying a DC voltage to the electrode member to electrostatically attract the wafer positioned on the mounting face; and

a cooling unit for cooling the electrode member,

wherein the mounting face of the electrode member is divided into

a first area, which is located in the center of the mounting face, wherein a metal, the material used for the electrode member, is exposed,

a first insulating area, the surface of which is covered with an insulating film, that encloses, like a ring, the outer edge of the first area,

a second area, wherein the metal is exposed, that is extended, like a ring, around the outer edge of the first insulating area, and

a second insulating area, the surface of which is covered with an insulating film, that encloses, like a ring, the outer edge of the second area,

wherein a boundary between the first area and the first insulating area is designated inside the outer edge of a small wafer positioned in the center of the mounting face, and a boundary between the first insulating area and the second area is designated outside the outer edge of the small wafer,

wherein a boundary between the second area and the second insulating area is designated inside the outer edge of a large wafer positioned in the center of the mounting face, and the second insulating area extends outward from the large wafer, and the second insulating area is located outside the outer edge of the large wafer,

wherein a plurality of suction holes are formed in the first and the second areas and a vacuum suction unit is provided to create a vacuum and produce suction that, through the suction holes, draws the wafer to and holds the wafer on the mounting face, and

wherein a cover member, which has a ring shape and which is detachable from the mounting face, is closely adhered across the entire face of the second area to completely cover all the suction holes formed in the second area.

10. A plasma processing apparatus according to claim 9, wherein the cover member is attached to the mounting face when a small wafer is to be processed, or is removed from the mounting face when a large wafer is to be processed.

11. A plasma processing apparatus according to claim 9, wherein the cover member has a main body made of ceramic, and a resin layer is deposited at a location, on the lower face of the main body, that contacts the second area.

12. A plasma processing apparatus according to claim 9, wherein the cover member has an outer ring and an internal ring that engages the outer ring, and a resin layer is deposited at a location, on the lower face of the inner ring, that contacts the second area.

13. A plasma processing apparatus according to claim 9, wherein the insulating film covering the first insulating area and the insulating film covering the second insulating area are made of aluminous ceramic.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.